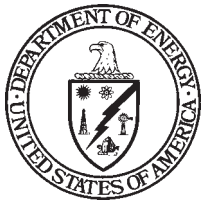
National Science Bowl®
Saturday Seminars



May 3, 2003
National 4-H Conference Center
Chevy Chase, MD

Seminars by Times and Locations

Room	Session I 9:00 - 10:15 a.m.
Aiton Auditorium	*Plenary Session* *Genesis: Science and the Beginning of Time* *Dr. Raymond Orbach* *Facilitator: Sue Ellen Walbridge*
	Session II **10:30 - 11:45 a.m.**
Arkansas	*The Science & Technology of Ice Cream* *Dr. Robert Roberts* *Facilitator: Chris Milne*
California	*Beyond the Edge of the Sea* *Dr. Cindy Lee Van Dover* *Facilitator: Bob Kuech*
Colorado	*You did WHAT with your TI-83+?* *Ms. Pat Maturo* *TEACHER WORKSHOP*
Idaho	*Nanotechnology: Fact, Fiction, & Fantasy* *Dr. Paul Burrows* *Facilitators: Michael McGinnis, Steve Woodruff*
Illinois	*Forensic Science & Television* *Mr. Joseph Bono* *Facilitator: Bernadette Ward*
Louisiana	*Origami, Linkages & Polyhedra* *Dr. Erik Demaine* *Facilitator: Steve Woodruff*
Missouri	*Enhancement Activities* *Facilitators: Jan Tyler, Dawn Pepe, Vince Shielack*
Montana	*Who's Afraid of a Few Mars Rocks?* *Dr. Abigail Salyers* *Facilitator: Debra Halliday*
Ohio	*Mr. Magnet's Science* *Mr. Paul Thomas "Mr. Magnet"* *Facilitator: Saren Johnston*
Washington	*Crawling & Searching: NASA Robots* *Mr. Robert Hogg* *Facilitator: Dean Williams*

Room	Session III 1:30-2:45 p.m.
Arkansas	*To Mars via Utah* *Mr. Derek Shannon* *Facilitator: Tim Gerhart*
Colorado	*You did WHAT with your TI-83+?* *Ms. Pat Maturo* *TEACHER WORKSHOP*
Idaho	*Nanotechnology: Fact, Fiction, & Fantasy* *Dr. Paul Burrows* *Facilitator: Steve Woodruff*
Illinois	*Forensic Science & Television* *Mr. Joseph Bono* *Facilitator: Debra Halliday*
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Missouri	*Enhancement Activities* *Facilitators: Jan Tyler, Dawn Pepe, Vince Shielack*
Montana	*Who's Afraid of a Few Mars Rocks?* *Dr. Abigail Salyers* *Facilitator: Chris Milne*
Ohio	*Mr. Magnet's Science* *Mr. Paul Thomas "Mr. Magnet"* *Facilitator: Rob Sanford*
Washington	*Crawling & Searching: NASA Robots* *Mr. Robert Hogg* *Facilitator: Tom Meyer*

Cover Illustrations from the National Science Bowl® Saturday Seminars, May 4, 2002.

Front Cover, top: Mr. Paul Thomas, aka "Mr. Magnet," leads a demonstration on magnetism. Bottom: Dr. Carole Baldwin discusses deep sea life off the Galapagos Islands.
Back Cover, top and bottom: Dr. William Phillips, Nobel Laureate, demonstrates the concepts behind laser cooling and trapping. Middle: Dr. Judith Young talks about constructing a sunwheel on the campus of University of Massachussets.

Need to Brush up for the Science Bowl Competition?

Choose any of the seminars that interest you on the previous pages for each session. If they all look good and you want to see which would benefit you in the competition, they are grouped below by National Science Bowl® question subject area.

Want to expand your ***Astronomy***? Observe page 11.

Need to enliven your ***Biology***? Look at pages 13, 14 and 15.

Inhibited on your ***Chemistry***? Read page 7 or12.

Want to shake up your ***Earth Science***? Cross examine page 15.

Have a ***Math*** problem? Spend your time on page 9.

Need a lift on ***Physics***? Check out pages 8 and 10.

Question on ***General Science***? Go to all of them!

Good Luck!

Genesis: Science and the Beginning of Time

Dr. Raymond Orbach

Plenary Session
Aiton Auditorium
9:00 - 10:15

Humankind has always been concerned with its origins, its place in the universe, and its future prospects. The Bible, a sacred epic, begins with: "B'reishit bara' Elohim et ha-shamayim v'et ha-aretz," or "In the beginning, God created the heaven and the earth." The first three lines, Genesis 1:1-3, are an inspiring statement of creation. Modern science is attempting to understand in its own terms the evolution of our universe from "the beginning." This talk will explore what has been learned to date, and what more we hope to learn, using observation, theory, and computational simulations for our beginning, existence, and future.

Dr. Raymond L. Orbach was sworn in as the 14th Director of the Office of Science at the Department of Energy (DOE) on March 14, 2002. As Director of the Office of Science, Dr. Orbach manages an organization that is the third largest Federal sponsor of basic research in the United States and is viewed as one of the premier science organizations in the world. Prior to his appointment, Dr. Orbach served as Chancellor of the University of California (UC), Riverside from April 1992 through March 2002; he now holds the title Chancellor Emeritus. During his tenure as Chancellor, UC Riverside grew from the smallest to one of the most rapidly growing campuses in the UC system. Enrollment increased from 8,805 to more than 14,400 students with corresponding growth in faculty and new teaching, research, and office facilities. Dr. Orbach received his Bachelor of Science degree in Physics from the California Institute of Technology in 1956. He received his Ph.D. degree in Physics from the University of California, Berkeley, in 1960 and was elected to Phi Beta Kappa. Dr. Orbach was born in Los Angeles, California. He is married to Eva S. Orbach. They have three children and seven grandchildren.

You did WHAT with your TI-83+? Teacher Workshop

Ms. Pat Maturo

Colorado
10:30 - 11:45
1:30 - 2:45

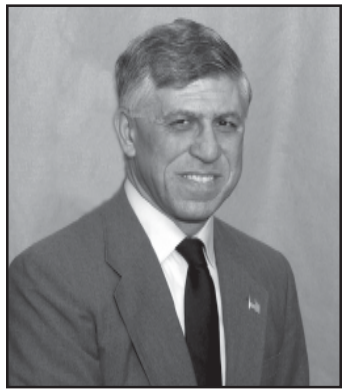
Science teacher Pat Maturo leads teachers on a discovery tour of Handheld Software Applications (Apps) and the new TI-Navigator - tools that make the most of technology your students may already use!

Currently a chemistry teacher at Thomas Jefferson High School for Science and Technology in Alexandria, Virginia, Pat Maturo has been leading T-Cubed and other graphing technology workshops in science since 1994. A CHEMBIO Steering Committee Member, she co-authored BioAlgebra for the State of Virginia and has hosted pilot sites for the Study Card and Navigator projects. She is a National Board Certified Teacher of Science and a State Finalist in PAEMST.

Forensic Science and Television: Fact or Fiction?

Mr. Joseph Bono

Illinois
10:30 - 11:45
1:30 - 2:45



This talk will describe what forensic science can and cannot do. The public perception of forensic science is formed by television shows. Is this perception correct? Or can the realities of forensic science be found elsewhere?

Mr. Joseph P. Bono is currently in the Office of Forensic Sciences at the Drug Enforcement Administration, where he has worked since 1988. Before the DEA, Mr. Bono worked for the Naval Investigative Service Regional Forensic Laboratory in California, Hawaii, and Italy, as well as the St. Louis County Police Department Laboratory. He earned a Bachelor of Science in Chemistry from the University of Missouri, and a Master of Arts in Political Science from the University of Missouri. He has traveled extensively to foreign countries with the DEA. He has been professionally affiliated with the American Academy of Forensic Sciences (AAFS) since 1977, serving in many positions, including the Board of Directors. He has contributed to the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) and the International Drug Profiling Conference (IDPC). He is also a member of the Midwestern Association of Forensic Scientists, Mid-Atlantic Association of Forensic Scientists, American Society of Crime Laboratory Directors and the American Society of Crime Laboratory Directors/Laboratory Accreditation Board.

Nanotechnology: Fact, Fiction, and Fantasy

Dr. Paul Burrows

Idaho
10:30 - 11:45
1:30 - 2:45

For as long as humans have used tools, engineers have steadily developed ever more precise methods for manufacture, turning natural materials (rock, iron, silicon, etc.) into useful products (spearheads, steam engines, integrated circuits, etc.). In contrast, nanotechnology offers the promise of designing and manipulating at the molecular level and subsequently assembling from the smallest scale imaginable up to new materials with useful properties that do not exist in nature. We will explore and contrast the reality of nanotechnology as it stands now, the promise and pitfalls of the near future, and some of the fears and fantasies which will likely stay in the realm of science fiction.

Dr. Paul Burrows is a Laboratory Fellow at the Pacific Northwest National Laboratory (PNNL) in the Energy Science and Technology Division. Dr. Burrows also serves as Manager of PNNL's Nanoscience and Technology Initiative, which is one of a handful of transforming initiatives at PNNL. He is also currently leading projects in the area of organic and hybrid thin film deposition, particularly organic electroluminescent display engineering, nonlinear optical materials, hybrid organic-inorganic semiconductor integration, and three dimensional electronic devices using organic materials. He is the co-author of over 95 publications and 48 issued U.S. patents, mostly in the area of organic semiconductors. Prior to his employment at PNNL, Dr. Burrows was a Research Scholar at Princeton University in the Department of Electrical Engineering. He has also held positions at the University of Southern California and the Riken Institute in Saitama, Japan. He earned his B.S. and Ph.D. Physics degrees from the University of London for "Electron Transport in Langmuir-Blodgett Films."

Origami, Linkages and Polyhedra: Folding with Algorithms

Dr. Erik Demaine

Louisiana
10:30 - 11:45
1:30 - 2:45

Origamists have designed thousands of ways to fold a piece of paper to produce an incredible variety of interesting models – butterflies, elephants, castles, dragons, masks, hats, cuckoo clocks, geometric objects – all the way to deployable space structures. What makes paper so flexible to allow such amazing variety? Are there limits—some objects that cannot be folded? Or some objects that could be folded in principle, but would require too many creases to fold in practice? Can a computer design an origami model? If I unfold an origami model, what crazy patterns of creases might I see? If I give a computer a pattern of creases, can it figure out how to refold the paper?

Origami mathematics and computational origami are two relatively new areas of research that try to answer these kinds of questions from the point of view of mathematics and computer science. These areas fit into the broader context of geometric folding and unfolding problems, which range from folding robotic arms and protein folding (linkages) to cutting open geometric surfaces (polyhedra). This talk will describe some of the latest results in this newly developed field, and show models to illustrate some of the more surprising results.

Dr. Erik Demaine is an assistant professor in computer science at MIT. His research interests center around algorithms and related topics in mathematics and computer science, particularly discrete and computational geometry, advanced data structures, and combinatorial games. He has written about 80 papers with about 100 different colleagues on a variety of topics. He enjoys traveling the world, and on a good day, he can juggle 5 balls.

Mr. Magnet's Science

Mr. Paul Thomas

Ohio
10:30 - 11:45
1:30 - 2:45

Take a mesmerizing journey of discovery into the fascinating realm of magnetic phenomena. Paul Thomas, better known at MIT as Mr. Magnet, will uncover before your eyes the secret forces of ferromagnetism and magneto-electricity. What mysterious force field holds steady an aluminum fry pan suspended in space? A magnetic impulse launches Garfield into space and with sudden forceful energy bends metal into a useful shape. Light up the White House by generating electric energy with your muscle power. How many watts can you generate? If you dare, discharge one million volts of electric potential holding a lightning rod in your bare hands. The Mr. Magnet show is just for the fun of it.

Mr. Paul Thomas is currently a Plasma Science and Fusion Center Technical Supervisor at MIT. After graduating from technical school, Mr. Thomas joined High Voltage Engineering Corporation, where he worked under the guidance of Robert J. Van de Graaff to develop high voltage apparatus for research. He pursued a degree in electrical engineering at Northeastern University. Mr. Thomas joined the Massachusetts Institute of Technology in 1983, where as part of a team of scientists and engineers, he supervised the integration of computer controls on a large-scale fusion experiment. Nine years later, Mr. Thomas began his educational outreach by building a series of demonstrations and bringing them in a van into Boston area schools. In the 9 years since the first school visit, Mr. Magnet has presented the program to nearly 300,000 students and teachers in the New England region. The show has also traveled to New Orleans, Atlanta, and Washington, D.C. for special events.

Crawling and Searching: A Few NASA Robots

Mr. Robert Hogg

Washington
10:30 - 11:45
1:30 - 2:45

At NASA's Jet Propulsion Laboratory (JPL), different mobile robots are designed towards different applications and environments, ranging from all manner of space exploration to urban reconnaissance. "Urbie" is a robot designed to be carried into an unknown urban area to investigate potential hazards to humans. This could include search and rescue in collapsed buildings, and unmanned reconnaissance in urban terrorist incidents. This robot uses an on-board autonomous navigation system that can avoid obstacles, follows virtual paths, and even climb stairs – all automatically. The Micro-Robot Explorer is a small, inexpensive, legged robot that is being designed towards several future applications. One possibility is to make hundreds of such robots with integrated sensor packages, thereby creating a sensor web that can be changed and adapted as desired. Sensor data from each node in the wireless web is propagated back to a base station that records and relays it to waiting scientists.

Mr. Robert Hogg is a Robotics Engineer in JPL's Mobility Systems Concept Development section. He developed systems and behavior software for the JPL Tactical Mobile Robot project then later lead the team for two years and concluded the project with a successful delivery of the DARPA program's final Perception Packbot. Robert is currently the primary investigator of the Micro-Robot Explorer research task, which involves mobility-based research for adaptable sensor webs. Robert began his career at JPL on the flight software team for Deep Space One, a spacecraft that tested 12 advanced high-risk technologies in space and returned priceless images from Comet Borrelly. His teams received the JPL Award for Technical Excellence for these projects in 1999 and 2000. Robert graduated with honors from the University of California Los Angeles in 1998 with a B.S. in Computer Science and Engineering.

The Science and Technology of Ice Cream

Dr. Robert Roberts

Arkansas
10:30 - 11:45

Ice cream is a nearly universally enjoyed food, but it is also a complex food colloid consisting of air bubbles, fat globules, ice crystals and an unfrozen serum phase. This presentation will include information about the composition of ice cream and various frozen desserts; describe the functions of the ingredients used to formulate ice cream products; and discuss the processes used to manufacture the ice cream mix, and to freeze the prepared mix into the final ice cream product. In addition, Dr. Roberts will outline his research into fortification of ice cream with omega-3-fatty acids.

A native of Burlington, Vermont, Dr. Roberts earned a BS in Dairy Technology from the University of Vermont in 1984, an MS in Dairy Science from South Dakota State University in 1986, and a Ph.D. in Food Science from the University of Minnesota in 1991. In 1991, Bob joined the faculty of the Food Science Department at The Pennsylvania State University with primary responsibilities in teaching and research. Dr. Roberts was promoted to Associate Professor of Food Science in 1998. Since joining the Faculty at Penn State, Dr. Roberts has been responsible for coordinating the Undergraduate Program and teaching a variety of courses including “Introduction to Food Science,” “Chemical Methods of Food Analysis” and “Science and Technology of Dairy Products.” In addition, Dr. Roberts has maintained an active research program in the areas of dairy microbiology and dairy product quality. In 1999, Dr. Roberts accepted Directorship of the Penn State Ice Cream Short Course, the Penn State Pasteurizer Operators Workshop, and introduced the Penn State Cultured Dairy Products Short Course. In 2000, Dr. Roberts assumed responsibility for dairy manufacturing extension programs at Penn State. Currently Dr. Robert’s research is focused in two areas, the possibility of incorporating functional ingredients into ice cream (such as omega-3-fatty acids), and the mechanisms of cryotolerance of probiotic bacteria.

Who’s Afraid of a Few Mars Rocks?

Dr. Abigail Salyers

Montana
10:30 - 11:45
1:30 - 2:45

Should we bring back samples from Mars or other planets? Is there a danger in doing this? Could microorganisms capable of causing human disease evolve in a place where there are no humans? These questions do not have a simple answer, but the purpose of the presentation is to provide some insights into the pros and cons of this controversy. Also to be addressed is the question of whether we have contaminated other planets by not sufficiently sterilizing our space probes, and if so, what are the possible consequences of this contamination.

Abigail Salyers is a Professor of Microbiology at the University of Illinois (Urbana), where she has conducted research and taught for 23 years. Dr. Salyers earned her Ph.D. in Physics at the George Washington University. After working as a physicist for nearly 10 years, she made the transition to microbiology by doing postdoctoral work at Virginia Polytechnic Institute. Dr. Salyers’ research has focused on the bacteria that are normally found in the human intestinal tract, in particular the mechanisms by which these bacteria become resistant to antibiotics. She has published over 150 scientific papers and two textbooks for undergraduate courses. Dr. Salyers serves as a reviewer of grants for the National Institutes of Health and the Department of Energy. She was co-director of the Microbial Diversity Summer Course at the Marine Biological Laboratory from 1995–1999. She has provided expert testimony on genetically modified plants and antibiotic use in agriculture for a variety of regulatory agencies in Europe and the U.S., and she has testified before a congressional subcommittee on genetically modified plants. From 2001-2002, Dr. Salyers served as the President of the American Society for Microbiology, a scientific society that has over 40,000 members.

Beyond the Edge of the Sea

Dr. Cindy Lee Van Dover

California
10:30 - 11:45

When Rachel Carson wrote of marine life at the edge of the sea, life beyond the edge was nearly unfathomable. William Beebe had dived to shallow depths in the Bathysphere to view the "Society of Wonders" in the 1930s, but exploration of the deep ocean, far beyond the edge of the sea, was a frontier of science in the mid 1900s. Even now the deep sea remains a vast unexplored wilderness. Technology for studying ecosystems beyond the edge of the sea are rapidly developing. We can design sophisticated experiments, gather terabytes of observatory information, and undertake programs that once seemed the provenance of outer space. ALVIN has ferried generations of scientists to and from the abyss and is responsible for a record number of scientific discoveries in the deep sea.

Dr. Cindy Lee Van Dover is a deep-sea biologist with an interest in the biology of hydrothermal vents. She earned a M.S. in ecology from UCLA, and then continued to the MIT/Woods Hole Oceanographic Institution Joint Program in Biological Oceanography. In 1989, she described a novel photoreceptor in a vent invertebrate, which in turn, led to discovery and characterization of a geothermal source of light at vents and investigations of its biological significance. Her current research focuses on the study of biodiversity and biogeography of vent faunas. On receiving her Ph.D., Van Dover joined the group that operates the deep-diving submersible ALVIN. Her work with ALVIN has taken her to nearly all of the known vent fields in the Atlantic and Pacific, as well as to deep-water sea mounts, seeps and other significant seafloor features. In addition to research, Van Dover has authored a popular book for the lay audience about the deep sea and her experiences as an ALVIN pilot – *Deep-Ocean Journeys*, 1997, a.k.a. *The Octopus's Garden*. She is also the author of the first textbook on hydrothermal vents, *The Ecology of Deep-Sea Hydrothermal Vents*. Dr. Van Dover is the Marjorie S. Curtis Associate Professor in the Biology Department at The College of William & Mary.

To Mars via Utah: Simulating Human Mars Exploration at the Mars Desert Research Station

Mr. Derek Shannon

Arkansas
1:30-2:45

Mr. Derek Shannon discusses his experience as crew geobiologist during exciting Mars mission simulations in the beautiful badlands of Southern Utah--seen only through a space helmet or the windows of the crew's giant tin can hab!

Mr. Derek Shannon attended the 1997 and 1998 National Science Bowls representing Minot High School in Minot, North Dakota, where his team reached the quarter-finals its second year. Derek received his B.S. in geobiology from Caltech in 2002, and is now a grad student in astrobiology at the University of Southern California. He has worked with Mars Global Surveyor data on the Martian southern polar region, investigated the possibly biological origin of magnetite crystals in the Allan Hills Mars meteorite, and participated in human Mars mission simulations in the Utah desert. At USC, Derek applies infrared mapping from NASA's Mars 2001 Odyssey spacecraft to the search for life on the Red Planet.

Enhancement Activities: Work and Power Bridge Contest

Missouri
10:30 - 11:45
1:30-2:45

16 Teams can participate in each session. To sign up, put your team's name on the list in the Anderson Room.

Work and Power - Build a machine that will do work using air power that you provide.

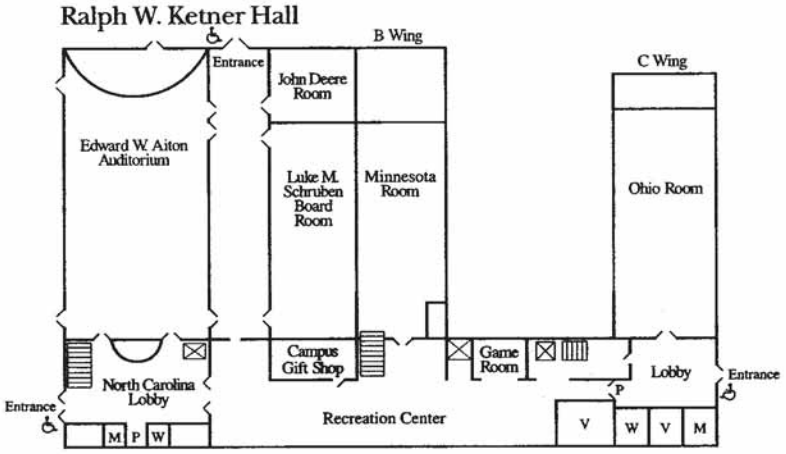
Objective: Design and build the most powerful machine, to operate on wind power that your team generates by blowing, that will lift dice from the floor to the level of the table top.

Bridge Contest - Build a bridge using only paper and paper clips. Bridge strengths will be tested by loading washers onto them.

Objective: Design and build the strongest bridge your team can, using only 1 sheet of construction paper and 10 paper clips.

Teams will have 35 minutes each for each activity and can only submit one official entry each per activity. Prizes will be awarded to the winning team for each activity.

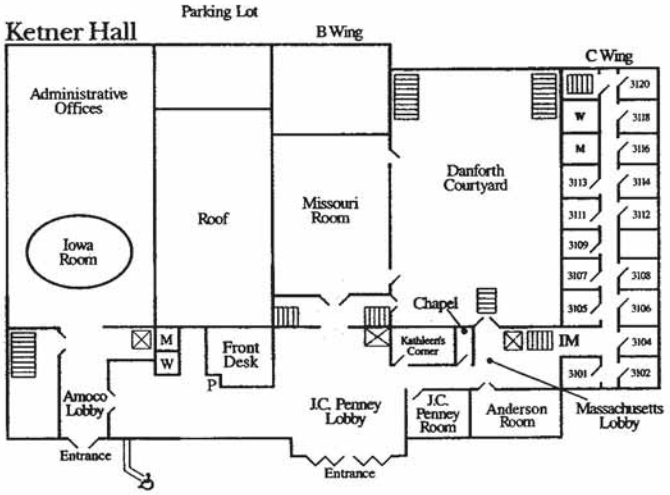
Interior Campus Map



Lower Level

J.C. PENNEY HALL

ROOMS 3101-3120



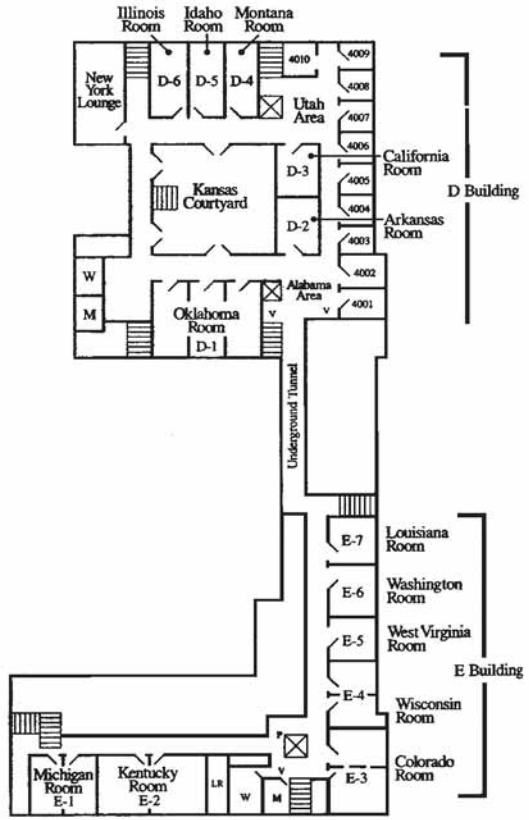
Ground Floor

ROOMS 4001-4010

FIRESTONE HALL

MCCORMICK HALL

W.K. KELLOGG HALL



Lower Level

KEY

- ELEVATORS
- STAIRS
- M W REST ROOMS
- LR LAUNDRY ROOM
- IM ICE MACHINES
- V VENDING MACHINES
- P PHONE
- ACCESSIBLE ENTRANCE